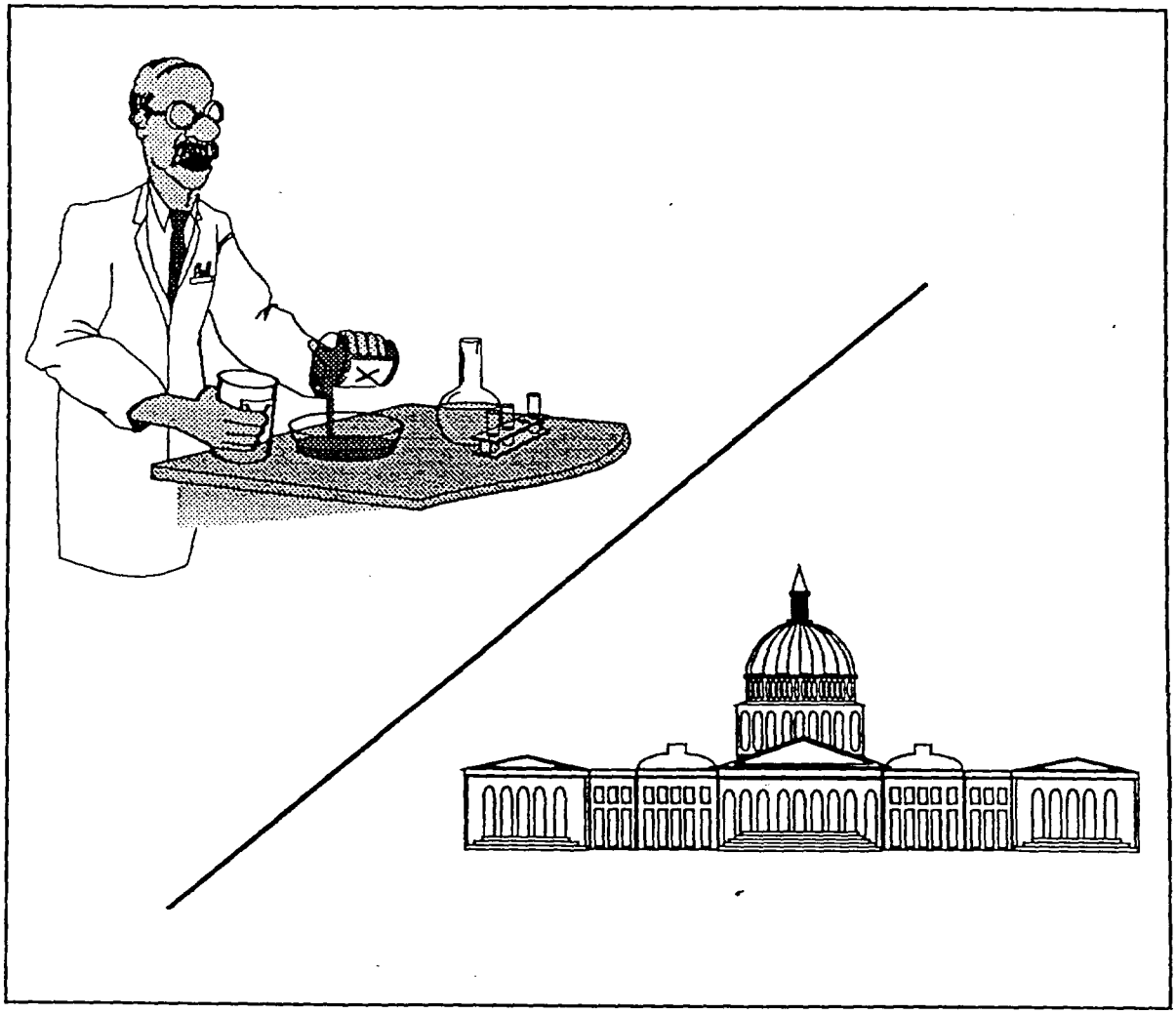
Lesson 5

From Problem Identification To Regulation



Questions To Consider

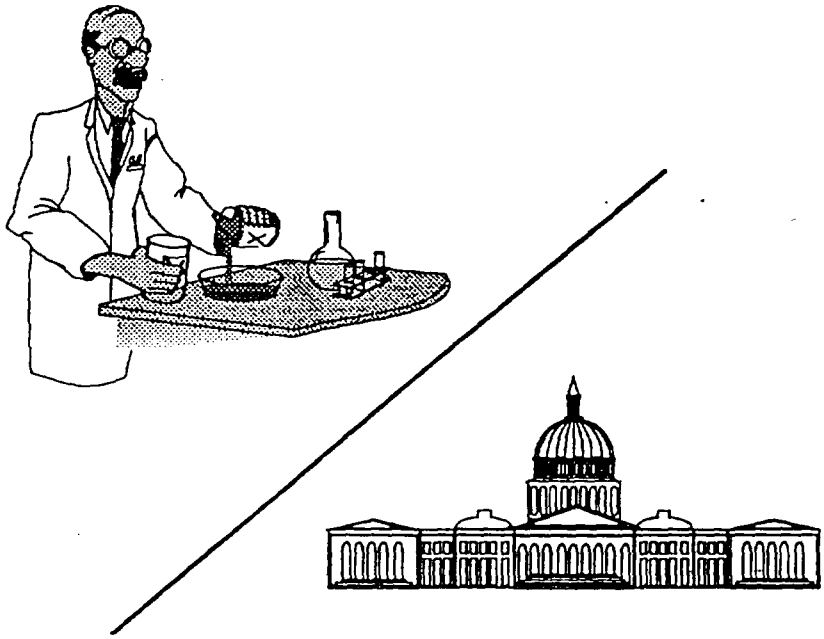
- How have health-risk-based regulations been used by EPA?
- Why are health-risk-based regulations difficult to apply to hazardous air pollutants?
- What technology-based regulations are being used by EPA?
- How is risk analysis being used in setting emission standards?

Key Terms

- Criteria pollutants
- Hazardous air pollutants
- National Ambient Air Quality Standards (NAAQS)
- Maximum achievable control technology (MACT)
- MACT Hammer

From Problem Identification To Regulation

After various studies indicated that some air pollutants were indeed health hazards, the government was faced with the obligation of regulating these substances to safe levels. Charged with the duty and power to set emission standards, EPA set out to determine critical levels of hazardous substances, based on health risks. EPA soon discovered that this was a next-to-impossible task, and subsequently, regulations for hazardous air pollutants were slow in coming. The 1990 Clean Air Act Amendments (1990 CAAA) were, in part, designed to remedy this situation. They broke the logjam by shifting the basis of hazardous air pollutant regulations from health risks to achievable technology. Before analyzing this technology-based regulatory system, let's take a closer look at the health-effect-based regulations of the 1970 Clean Air Act.



Various studies showed that some air pollutants were health hazards, so the government had to regulate them.

Health-Effect-Based Regulations

The 1970 CAA provided a regulatory mechanism to reduce harmful air pollutants.

The primary purpose of the 1970 Clean Air Act (CAA) was to provide the regulatory mechanism to reduce concentrations of harmful air pollutants to levels that cause negligible adverse health effects. This effort has been extremely successful for a particular group of substances prevalent in the ambient air.

National Ambient Air Quality Standards (NAAQS)

During the late 1940s and early 1950s many people noted a change in air quality around densely populated areas, particularly major metropolitan areas such as New York City and Los Angeles. Research into the causes of this "smog" yielded some remarkable findings:

- The culprit chemicals came mostly from the burning of fossil fuels to power transportation vehicles.
- Although the smog was most noticeable in densely populated areas, the chemicals themselves existed nearly everywhere in the ambient air.

Criteria pollutants cause adverse health effects, and they can be found in the ambient air.

Various studies were conducted to determine whether these far-ranging chemicals were harmful to those who breathed them. Study after study indicated that the substances did indeed have adverse human health consequences, from eye irritation and sore throat to bronchitis and more serious effects. These findings made headlines, and more studies were requested. By the late 1960s, the data on the harmful levels and effects of these substances were sufficient to enable Congress to establish regulations for acceptable levels in the ambient air. The data for each chemical were compiled in an air quality criteria document, and the chemicals came to be called the **criteria pollutants.**

The **National Ambient Air Quality Standards (NAAQS)** currently regulate the following criteria pollutants:

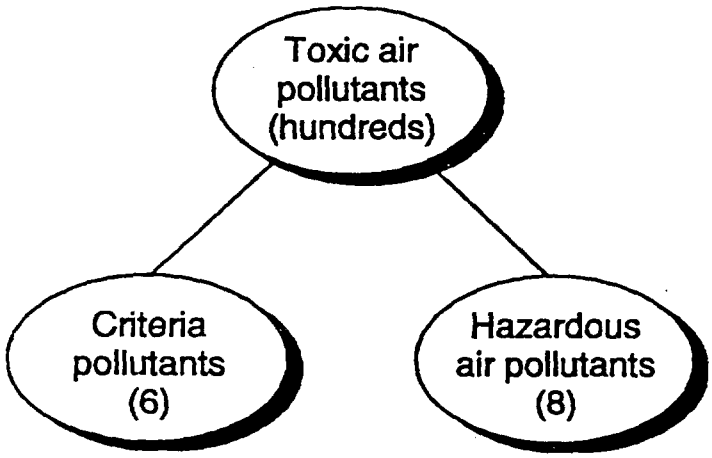
- Carbon monoxide (CO)
- Lead (Pb)
- Nitrogen oxides (NO_x)

- Ozone (O_3)
- Particulate matter less than 10 micrometers in diameter (PM_{10})
- Sulfur oxides (SO_x)

National Emission Standards For Hazardous Air Pollutants (NESHAP)

Of course, in 1970 the ambient air contained other toxicants besides the criteria pollutants. This was especially true in and around industrial facilities. All non-criteria pollutants came to be grouped under the term **hazardous air pollutants**. For hazardous air pollutants, the 1970 Clean Air Act mandated health-risk-based standards set at a level that protects the public health with an ample margin of safety.

The 1970 CAA mandated health-risk-based standards.



Using health-risk-based standards, only six criteria pollutants and eight hazardous air pollutants were identified.

In particular, EPA wanted to pinpoint the critical level at which a hazardous air pollutant increases the incidence of an adverse effect by one in a million over the general population incidence. Unfortunately, many of the substances of concern had not been headline-grabbers in the 1950s and 1960s, and studies were woefully inadequate to yield such precise data. With researchers working furiously, EPA struggled to regulate just eight hazardous air pollutants over a period of 10 years.

National Emission Standards For Hazardous Air Pollutants (NESHAP) currently exist for the following substances:

- Arsenic
- Asbestos
- Benzene
- Beryllium
- Mercury
- Radon
- Radionuclides other than radon
- Vinyl chloride

Why Health-Effect-Based Regulations Are Difficult To Apply

Hazardous air pollutants are generally source-specific chemicals that cause concern only in isolated areas.

The regulatory mechanism put in place by the 1970 Clean Air Act was ineffective for setting hazardous air pollutant standards for a variety of reasons. For one, the substances of concern were nothing like the criteria pollutants, which were basically everywhere. Hazardous air pollutants are generally source-specific chemicals that cause concern only in isolated areas. Such chemicals did not cause widespread public concern because it was assumed that people could avoid exposure if they chose. Accidental chemical releases that affected the general population, particularly the one in Bhopal, India, in 1984, helped garner public support for regulating hazardous air pollutants. The occupational health movement also pushed the government toward better hazardous air pollutant controls.

Another problem with regulating hazardous air pollutants through the 1970 legislation was that many are carcinogenic. You'll remember from Lesson 4 that carcinogens exhibit no threshold dose—even the tiniest amount can lead to cancer. The 1970 Act was explicit in requiring a safe emission standard that would provide an ample margin of safety. Obviously, for carcinogens this was impossible without totally eliminating the substances from the atmosphere, which was equally impossible.

As if that weren't enough, there was still the problem of the lack of data on these types of chemicals. Even when data were available, the ever-present issue of the validity of

toxicological data arose. Are results of animal studies applicable to humans? Can studies of 1 to 2 years' duration accurately indicate the consequences of exposure over longer periods—even a lifetime? What's more, humans are rarely exposed to one hazardous air pollutant in isolation. The multi-chemical exposures typical of real life introduce all the complicating factors of chemical interactions: synergism, antagonism, potentiation, etc. Simply put, too many variables influence the expression of adverse health effects in humans. Researchers are often hesitant to make the extrapolations and assumptions necessary to reach conclusions when legislation and possible legal accountability come into the picture.

Government agents realized that a new method for regulating hazardous air pollutants was needed.

For the few substances for which standards were established, new problems often arose. Sometimes the regulated emission standards were impossible to achieve with the technology available at the time. Consequently, most emission reduction goals went unrealized. Government agents knew that they needed a new, workable basis for regulating hazardous air pollutants, and they set about revising the 1970 legislation. The 1990 Act amended many of the shortcomings of the 1970 version.

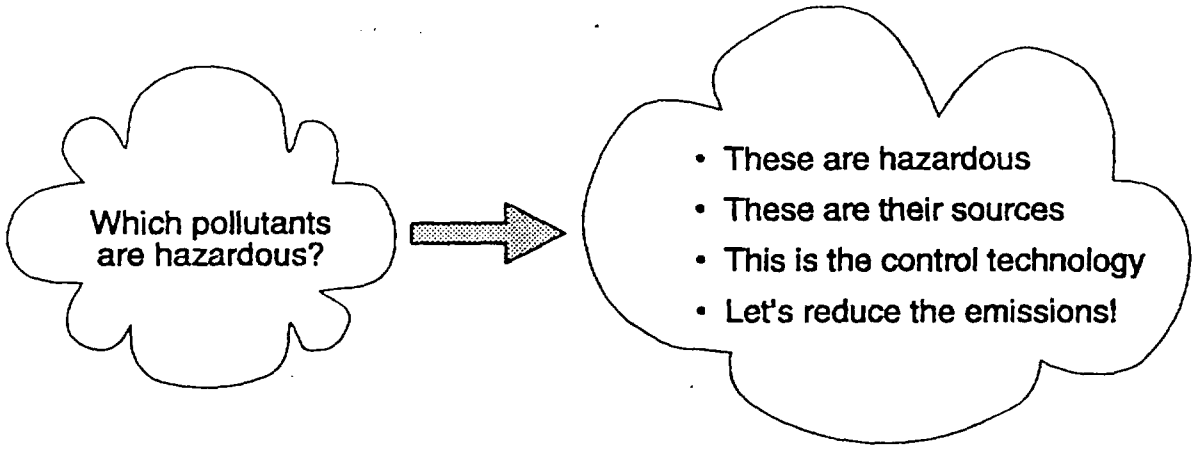
Technology-Based Regulations

The first efforts to establish technology-based emission standards actually appeared in the 1970 Clean Air Act. According to the legislation, some toxic air pollutant emitters were to apply either reasonably available control technology (RACT) or best available control technology (BACT) to bring their toxic emissions under control. The implementation process was extremely complex, however, and these regulations were rarely used.

The 1990 CAAA provided a list of 189 HAPs.

The 1990 CAAA sidestepped the problem of identifying critical levels of hazardous air pollutants by providing an extensive list of 189 hazardous air pollutants (referred to by the acronym HAPs) by chemical names and categories and by establishing workable, technology-based regulations. In essence, EPA shifted from saying, "Hold on; we're trying to identify some hazardous air pollutants and their critical levels," to saying, "Here are the hazardous air pollutants; here are their typical sources; here are the available control

technologies; let's reduce some emissions!" The required pollution-control technologies are divided into various classifications according to pollutants and sources.



The responsibility for change was given to the sources of the pollutants.

An important step toward establishing standards based on control technologies rather than on health risks associated with certain toxicant concentrations was the creation of the source category list. Shifting the focus from the pollutants themselves to the sources of the pollutants took the burden of proof off EPA and placed the responsibility for change on the industries that were actually emitting harmful substances into the atmosphere. Congress required EPA to list source categories (by industry) that emit one or more of the 189 hazardous air pollutants and to publish a schedule for regulating the listed source categories.

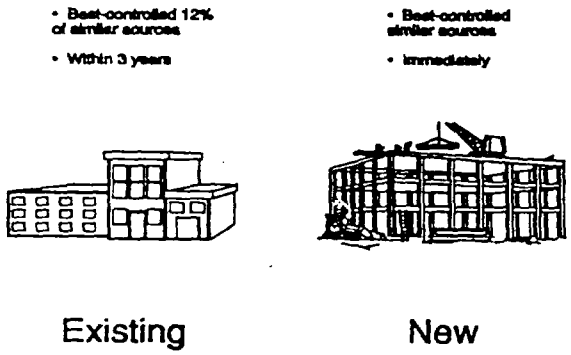
Another component of the 1990 CAAA that was critical in making the technology-based standards more feasible than those attempted in the 1970 Act was the consideration of other variables besides pollutant concentrations and health risks. The 1970 Clean Air Act succeeded in bringing nearly all the criteria pollutants under control but only at great cost to some businesses and industries: some companies had to close down. In contrast, the 1990 legislation clearly states that the cost of achieving emission reductions and the associated environmental effects and energy requirements must be taken into account.

Maximum Achievable Control Technology (MACT)

The 1990 CAAA introduced a new classification of control technology—**maximum achievable control technology**, or **MACT**. Measures taken to implement these technology-based standards can include any or all of the following:

- Process changes
- Material substitutions
- Design/equipment modifications
- Enclosure
- Work practice changes
- Installation of control equipment
- Others

Determining the appropriate MACT for a specific source involves considering the source category and whether the source is new or existing. The MACT for existing sources is determined by the best-controlled 12 percent of similar sources. Also, existing sources must comply as soon as possible but no later than three years after promulgation of a standard. For new sources, the MACT is determined by the best-controlled similar source (as determined by EPA), and sources must comply immediately upon promulgation.



The Early Reduction Program gave major sources an opportunity to earn extensive compliance with MACT.

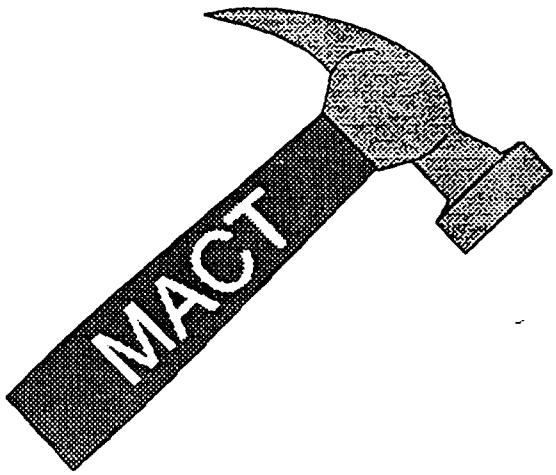
Any major source can earn a six-year extension for complying with a future MACT standard by voluntarily reducing hazardous air pollutant emissions 90 to 95 percent under the Early Reductions Program. Another strong incentive program is emission credit trading, in which companies that go beyond just meeting a standard acquire emission vouchers, which they can either use later or sell to noncompliant companies.

Risk-Based Regulations

Within the framework of technology-based regulation of hazardous air pollutants, EPA is now reinstituting risk assessment in the control process. For each of the source categories and each of the hazardous air pollutants emitted at the sources, EPA is establishing a priority list for regulation, based on the degree of hazard involved. Factors being considered include not only the toxicity and volume of the chemicals and the type of facility but also the distance to population, hydrogeological conditions, and the eventual fate of the chemicals themselves. This approach seems to offer the greatest potential for reducing toxic risks.

One drawback is that this type of risk assessment requires extensive information input. This has not meant, however, a return to the slow-motion regulatory process characterized by endless lab studies that was one of the main weaknesses of the 1970 Act. Most of the pertinent information is easily quantified. Also, it is immensely easier and quicker to establish relative risks among chemicals than it is to identify absolute risks associated with critical levels of specific chemicals.

In the event that EPA fails to provide MACT standards according to the source category regulation schedule, major sources of hazardous air pollutants must apply for emission permits from state or local regulatory agencies. Permits will then be issued on a case-by-case basis. This provision is known as the **"MACT Hammer."**



The MACT Hammer requires major sources of HAPs to apply for emission permits if EPA fails to provide MACT standards.

The 1990 hazardous air pollutant regulations, though technology-based, retain some of the spirit of the 1970 Act by acknowledging that elimination of adverse effects on human health is the ultimate concern. With the goal of making the air safe for everyone to breathe, EPA is dedicated to assessing and eliminating any residual risk after technology-based standards have been implemented.

Specifically, the 1990 CAAA require EPA to report to Congress, within six years of enactment, on the following issues:

- Methods of calculating any residual risk.
- Significance of residual risk.
- Actual health effects that present a residual risk.
- Uncertainties in risk-assessment methods.
- Potential negative consequences of risk reduction efforts.

If residual risk is identified for any source category or subcategory, EPA must promulgate health-based standards within eight years of the promulgation of the technology-based standards. In preparation for meeting this requirement, EPA is in the process of developing an efficient mechanism for establishing health-based standards.

1. What is the primary purpose of the 1970 Clean Air Act?

2. Pollutants in the ambient air found to cause adverse health risks were called _____.

3. How many hazardous air pollutants were identified to cause adverse health risks under NESHAP?

4. Why are health-effect-based regulations difficult to apply?

5. How can an industrial plant earn an extension for complying with a future MACT standard?

Answers To Review Questions

1. To provide the regulatory mechanism for reducing concentrations of harmful air pollutants to levels that cause negligible adverse health effects

2. Criteria pollutants

3. Eight

4. These regulations are difficult to apply to hazardous air pollutants because:
   - HAPs are much different than criteria pollutants.
   - Many HAPs are carcinogenic.
   - Lack of data.
   - Regulated emission standards were sometimes impossible to achieve.

5. By voluntarily reducing HAP emissions 90 to 95 percent before the standard is set